

DETERMINATION OF WATER RESOURCE CLASSES, RESERVE AND RESOURCE QUALITY OBJECTIVES IN THE KEISKAMMA AND FISH TO TSITSIKAMMA CATCHMENTS WITHIN THE MZIMVUBU-TSITSIKAMMA WATER MANAGEMENT AREA (WP11354)

TECHNICAL TASK GROUP MEETING RESOURCE QUALITY OBJECTIVES

**WETLANDS AND GROUNDWATER
K, L, M, N and P - CATCHMENT**

Presented by: GroundTruth and Collaborators
Directorate: Classification
Date: 5 June 2025

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WATER RESOURCE CLASSIFICATION

Step 2: delineate the catchment into IUA and describe the status quo

Integrated Units of Analysis:

- P (IUA_P01)
- M (IUA_M01)
- N (IUA_N01)
- L (IUA_L01; IUA_LN01)
- K (IUA_KL01, K01)

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WETLAND RESOURCE UNITS: APPROACH

- The resource units (RUs) are the building blocks of any reserve study
- The delineation of the Wetland Resource Units (WRUs) was undertaken using a three-step approach:
 - Step 1: Identification of potential priority wetland areas
 - Step 2: Identification of criteria and scoring
 - Step 3: Final selected priority WRUs
- The identification of WRUs is focused on identifying systems at an ecosystem level and is strongly reliant on knowing where important wetland systems are.
- Existing wetland coverages/knowledge had to be leveraged for this process

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WETLAND RESOURCE QUALITY OBJECTIVES

Step 1 - Identify potentially significant wetland resources
Step 2 - Identify, verify and prioritise wetland resources to inform the delineation of RUs
Step 3 - Delineate, verify and prioritise wetland resources to determine the REC and to inform the delineation of RUs

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WETLAND RESOURCE QUALITY OBJECTIVES

- RQOs for wetlands are vital for a variety of reasons not limited to:

Legally Mandated

Maintaining and Reinstating Wetland Functions and Services

Balancing Use and Protection

Addressing Impacts and Pressures

Supporting SDGs

Guiding Management and Monitoring

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WETLAND RQOs: DEVELOPING RQOs

- Specific indicators are key measurable elements that are linked to the different components and their sub-components. They need to be:
 - Quantifiable
 - Measurable
 - Verifiable
 - Enforceable
 - Sensitive
 - Representative
 - Cost-effective
- RQOs are based off these indicators as they provide specific criteria that the qualitative or quantitative RQOs aim to maintain or achieve

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GROUNDWATER RESOURCE UNITS: APPROACH

- Objectives are to maintain water quality status quo and provide allocatable groundwater to users
- Important for planning, licensing and monitoring
- Consideration of Groundwater Reserve components
 - Recharge
 - Basic Human Needs
 - Groundwater contribution to EWR/baseflow
- Existing monitoring data used for the assessment (Hydstra, WMS, Municipal where available)

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GROUNDWATER RESOURCE UNITS: APPROACH

- Groundwater resource unit delineation was based on aquifer type (primary aquifer, secondary aquifer, karst aquifer) and other physical, management and/or functional criteria
- Quaternary catchment boundaries which formed the basic unit for the GW Resource Directed Measures (GRDM) assessment
- The project area comprises 19 No. IUAs, with 345 No. quaternary catchments
- The delineation of 48 Groundwater Resource Units in previous stages
- GWRUs considered various criteria at the quaternary catchment level, and were then prioritised based on average weighting, with sub categories applying
- % Score per quaternary developed and final priority based on a scalable ranking system
- GWRU was assigned the highest quaternary priority score listed

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GROUNDWATER RESOURCE UNITS: APPROACH

Criteria

- Groundwater use (WARMS, NGA, density)
- Strategic GW Areas (SW, GW, SW-GW)
- Groundwater Dependency
- Stress Index
- Government Control Areas
- Water Quality
- Baseflow Component (new)



Quat	River	GW use (WARMS)	Strat GW Areas	GW Dependency	Stress	Govt Control Areas	GW Quality (EC)	Est. volume (m³/GW (Baseflow))	Overall score (Strat. RI)	% score	Priority (1-5)
K001	Stanhope & Un-named tributaries	5	1	1	1	1	1	18	51.4	7	1
K002	Warms & Glenhale	1	2	1	1	1	1	5	49.9	7	2
K003	Stanhope & Glenhale	4	2	2	1	2	2	21	52.1	3	1
K004	Grand & Slip	5	2	1	1	1	1	4	55.7	1	1
K005	Warms & Glenhale	5	2	1	1	1	1	4	55.7	1	1
K006	Stanhope & Un-named tributaries	3	2	1	1	1	1	4	55.7	1	1
K007	Stanhope	3	2	1	1	1	1	4	55.7	1	1
K008	Stanhope	3	2	1	1	1	1	4	55.7	1	1

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER

Groundwater

- Approach:
 - Data retrieved from all in-field assessments for this study
 - Priority groundwater:
 - RQOs for indicators (high confidences)
 - Abstraction rates, water levels, COCs
 - Water Levels – Hydstra
 - Chem - WMS

IUA	QUAT	GRU	Dist. rate (m³/d/ha)	Strat. GW Areas	GW Dependency	Stress	Govt Control Areas	GW Quality (EC)	Est. volume (m³/GW (Baseflow))	Overall score (Strat. RI)	% score	Priority (1-5)
IUA_K001	K001	Dnr_Ju02	5	1	1	5	1	3	3	59	54.3	1
			5	1	3	5	1	3	3	21	60.0	1
			5	1	3	5	1	4	3	22	43.9	1
			5	1	1	5	1	3	3	15	42.9	2
			5	1	1	5	1	3	3	15	42.9	2
			5	1	2	5	1	3	3	15	42.9	2
			5	1	2	5	1	3	3	15	42.9	2
			5	1	2	5	1	3	3	15	42.9	2

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER

Component	Description of Approach	Conditions	Special
Quantity and Aquifer	Water Levels	Set maximum drawdown of abstraction borehole to borehole critical depth	In the absence of monitoring points, establish monitoring station through hydrocensus, and set limits from baseline monitoring
	Abstraction Rates	Set peak maximum regional drawdown to maximum regional observed drawdown	
	Determination of protection zones	Set long term regional drawdown limit to the 75th percentile regional observed drawdown	
Quality	Abstraction Rates	To be uploaded monthly	Set COCs based on SPR groundwater users Apply TNQO for SPR use until baseline water quality can be established from identified monitoring station
	Protection zones	Determine from borehole yield testing	
	Identify COCs	COCs derived from available monitoring data Set peak result to maximum reported concentration of monitoring station Set long term trend limit to 75th percentile of monitoring station	
Ecological commitment	Protection zones	Determine from borehole yield testing	

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RESOURCE QUALITY OBJECTIVES WETLANDS AND GROUNDWATER

Groundwater Resource Units

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SUMMARY OF IUAs – PRIORITY RU

	IUA No.	IUA Code	Groundwater	Wetlands
Upper Kromme / coastal	1	IUA_K01	✓	✓
Lower Kromme and Gamtoos	2	IUA_KL01	✓	✗
Kouga and Baviaanskloof	3	IUA_LD1	✓	✓
Swartkops	4	IUA_M01	✓	✓
Upper Sundays and Groot	5	IUA_LN01	✓	✓
Lower Sundays	6	IUA_N01	✗	✗
Bushmans and Kariega	7	IUA_P01	✗	✗

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RESOURCE QUALITY OBJECTIVES: M CATCHMENT



- Groundwater**
- 3 prioritised RUs
 - Quantity and aquifer
 - Water levels
 - Time series
 - Abstraction rates
- Quality**
- Water quality
 - Microbial pollution
- Ecological**
- Protection zone along river/stream

- Wetlands**
- 2 prioritised RUs
 - Quantity
 - Quality
 - Habitat
 - Biota (birds)

IUA No.	IUA Code	Groundwater		RU	Quats	Wetlands
		RU	GW - Priority 1			
4	IUA_M01	GW_RU04	M10A, M10B	WRU04	M10B	Longmore Wetland Complex
		GW_RU05	M10C, M10D	WRU05	M10D	Chatty River Wetland Complex
		GW_RU06	M20A, M20B, M30A			

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RESOURCE QUALITY OBJECTIVES: WRU05 - Chatty Wetland Complex

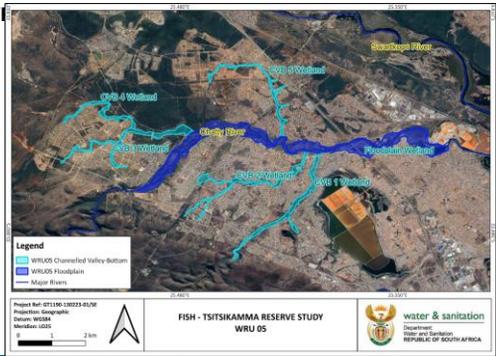
WRU	Wetland Name	Type	PES	EIS	BAS	Component Prioritised
WRU 05	Chatty River Wetland Complex	Floodplain	D	A	C/D	Habitat – Ecological Condition Quality – Water Quality Parameters
		Channelled Valley-Bottom	D	A	C/D	Habitat – Ecological Condition Quality – Water Quality Parameters

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RESOURCE QUALITY OBJECTIVES: WRU05



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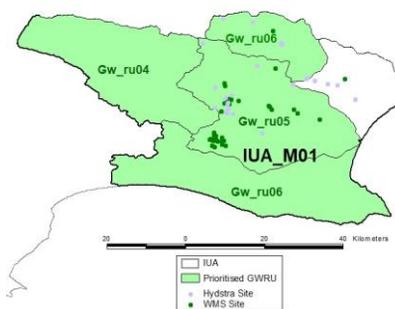
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RESOURCE QUALITY OBJECTIVES: WRU05 - Chatty Wetland Complex

Type	Component prioritised	Indicator	RQO	Management and Mitigation Measures
Floodplain	Habitat – Ecological Condition	Desktop and field verified PES category based on a Level 1B WET-Health assessment undertaken for the Chatty River floodplain wetland.	The PES of the Chatty River floodplain wetland should not fall below the IAS of C/D.	<ul style="list-style-type: none"> - No further expansion of residential or infrastructural developments, such as sport fields, schools, industrial parks, etc. activities, or other impinging land uses into the remaining natural areas of the wetlands (no more than 15% of the wetland area). - No further deterioration in the water quality component of the PES score of the wetlands. - No further <u>ganisation/turning/diversion</u> of the remaining intact areas of the wetland. - No further encroachment of IAPs should be permitted into the wetland. - The remaining intact buffer to the <u>northwest</u> of the floodplain wetland must be <u>maintained</u>. No further development should be permitted here.
	Quality – Water Quality Parameters	Estuary indicators apply (see water quality related estuary indicators for the Swartkops Estuary)	Estuary RQOs apply (see Swartkops Estuary RQO).	Estuary water quality numerical limits apply to the Chatty River floodplain. A bi-annual water quality monitoring program must be set up to monitor the water quality at the outflow of the Chatty River floodplain wetland. These water quality tests must be undertaken twice a year.

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER IUA M01 –GWRU05



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RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA M01 – GWRU04

Component	Indicator/Measure	Numeric Limit
Quantity and Aquifer	For water use applications higher than requirements for Reserve, Schedule 2 and General Authorizations, abstraction rates should not exceed the average recharge volume of the aquifer. Per large abstractions, or stressed catchments, increased level of assessment required. Dioxide, Nitrate, Intermediates, Contaminants. Recharge estimate. Reserve determination. Disturbance of smaller sub-regions.	0 = Average recharge per fraction 2 = sustainable yield determined by yield test
Quality	Water Levels in boreholes not to exceed CD. Medium to long term (1 to 5 years) water level trend based on drawdown must show recovery. The radius of influence should not intersect any other protection zone (L).	Active monitoring site available: None, hydrocarbon Identify monitoring site - hydrocarbon Peak drawdown in abstraction borehole - critical depth Regional drawdown > 75th percentile of identified monitoring site Determines from yield test data < L (m)
Quality	Reserve on existing water quality. Medium to long term (1 to 5 years) water quality must not exceed 75th percentile of monitoring data point. Protection zone from microbial pollution.	Active monitoring site available: None, hydrocarbon Identify water use - hydrocarbon Set limits based on aquifer water quality or SAQWQ TWQR for identified use Microbial (radius (L) = 20.2P ^{0.75} + 5) < L (m)
Ecological	Drawdowns from reserves to be prevented near water courses. Protection zone for watercourses to be required to protect the ecological reserve.	Determines from yield test data. < L (m)

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA M01 – GWRU04

Component	Sub Component	Indicator/Measure	Numeric Limit
Quantity and Aquifer	Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Guidelines. Time series water levels - Monthly Active monitoring site available: None Peak drawdown in abstraction borehole - critical depth	Hydrocarbon Identify monitoring site - hydrocarbon Regional drawdown < 75th percentile of identified monitoring
Quality	Compounds of Concern	COCs: Time series water quality (Quarterly / Bi annual) Active monitoring site available: None Peak result - maximum of monitoring boreholes Nutrients Salts Sulphates Other	Hydrocarbon Identify monitoring site Identify water use and COCs Long term trend < 75th percentile (mg/l) for COCs; Set limits based on baseline water quality or SAQWQ TWQR for identified use

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA M01 – GWRU05

Water Level Stats							Chem Stats	
min Lev	38.41	6.99	30.78	4.00	37.42	17.47	89782	46
max Lev	38.40	10.77	49.21	30.30	42.25	23.49	98062	2
Diff (L)	5.99	3.78	18.43	26.30	4.83	6.02	98067	2
75th (L)	4.57	2.87	8.17	17.32	3.68	4.34	102367	54

	CL	EC	F	NO3 2	NA	SO4
min	25.30	10.00	0.03	0.02	13.31	0.38
max	5182.00	1340.00	0.94	15.95	2216.00	445.80
75th	35.45	17.80	0.15	0.15	18.64	7.65

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA M01 – GWRU05

Component	Sub Component	Indicator/Measure	Numeric Limit
Quantity and Aquifer	Water Levels	For water use applications higher than requirements for Reserve, Schedule 2 and General Authorizations, abstraction rates should not exceed the average recharge volume of the aquifer. Per large abstractions, or stressed catchments, increased level of assessment required. Dioxide, Nitrate, Intermediates, Contaminants. Recharge estimate. Reserve determination. Disturbance of smaller sub-regions.	0 = Average recharge per fraction 2 = sustainable yield determined by yield test
Quality	Compounds of Concern	COCs: Time series water quality (Quarterly / Bi annual) Active monitoring site available: None Peak result - maximum of monitoring boreholes Nutrients Salts Sulphates Other	Hydrocarbon Identify monitoring site - hydrocarbon Regional drawdown < 75th percentile of identified monitoring Determines from yield test data < L (m)

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RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA M01 – GWRU05

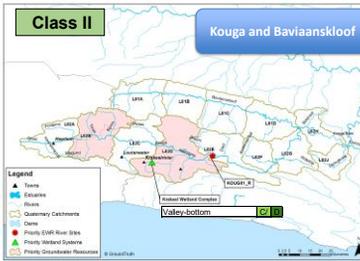
Sub Component	Indicator/Measure	Numeric Limit
Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Guidelines. Time series water levels - Monthly Active monitoring site available: None , time series Peak drawdown in abstraction borehole - critical depth	Regional peak groundwater drawdown < 5.2 m Regional long term groundwater drawdown < 75th percentile of 3.8 m
Compounds of Concern	COCs: Time series water quality (Quarterly / Bi annual) Active monitoring site available: 38 No. sites, 2 No. time series	Long term trend < 75th percentile (mg/l) for COCs;
Nutrients	NO3/NO2 < 0.2	NO3/NO2 < 0.3
Salts	EC < 31	EC < 38
Sulphates	SO4 < 12	SO4 < 6
Other	Na < 47 Cl < 87 F < 0.2 Pb < 0.02	Na < 59 Cl < 36 F < 0.2 Pb < 0.02

NO3/NO2	1
EC	230
SO4	250
NA	200
Cl	300
F	1.5

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RESOURCE QUALITY OBJECTIVES: L CATCHMENT



- Groundwater**
- 1 prioritised RUs
 - Quantity and aquifer
 - Water levels
 - Time series
 - Abstraction rates
 - Quality
 - Water quality
 - Microbial pollution
 - Ecological
 - Protection zone along river/stream
- Wetlands**
- 1 prioritised RUs
 - Quantity
 - Quality
 - Habitat
 - Biota (birds)

IUA No.	IUA Code	Groundwater		Wetlands	
		RU	GW - Priority 1	RU	Quats
3	IUA_L01	GW_RU03	L62B and L62D	WRU03	L62D

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**RESOURCE QUALITY OBJECTIVES:
WRU03-KRAKEEL WETLAND COMPLEX**

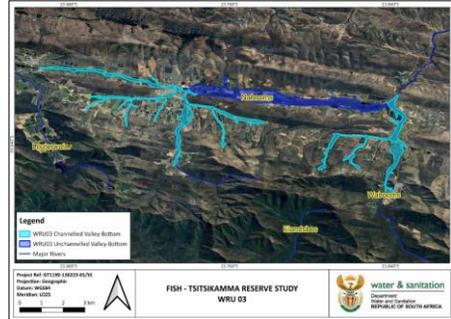
WRU	Wetland Name	Type	PES	EIS	BAS	Component Prioritised
WRU 03	Krakeel Wetland Complex	Valley Bottom	D	Very High	C/D	Habitat - Ecological Condition Habitat - IAPs

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**RESOURCE QUALITY OBJECTIVES:
WRU03-KRAKEEL WETLAND COMPLEX**



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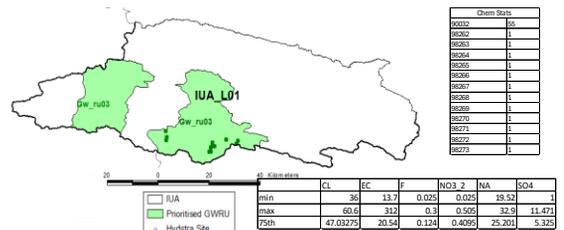
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**RESOURCE QUALITY OBJECTIVES:
WRU03-KRAKEEL WETLAND COMPLEX**

Type	Component prioritised	Indicator	RQO	Mitigation/Monitoring Measures
Valley Bottom	Habitat - Ecological Condition	Desktop and field verified PES category based on a Level 1B WET- Ecological assessment undertaken for the Krakeel wetland complex.	The PES of the Krakeel wetland complex should not fall below the BAS of QDI.	<p>Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change in the wetland and its catchment as well as at least 8 hours of field verification for each wetland. Specific factors that need to be assessed include:</p> <ul style="list-style-type: none"> No further expansion of agricultural activities or other impinging land uses into the remaining natural areas of the wetlands. No additional water reducing activities in the wetlands or their catchments No further deterioration in the water quality component of the PES score of the wetlands. No further degradation/turnover/deterioration of the remaining intact areas of the wetland.
	Habitat - IAPs	Extent of IAPs within the wetland relative to the extent of the remaining natural or semi-natural wetland areas recorded in the baseline assessment.	IAPs extent within the remaining natural or semi-natural wetland areas should be managed to ensure it does not increase above a threshold that could be potentially harmful to the habitat of the Krakeel wetland (2.5%).	Using available remote imagery, the extent of IAPs and removal efforts must be assessed annually. Site visits to confirm the extent and removal of IAPs should be carried out every two years. The extent of IAPs within the remaining natural or semi-natural wetland areas within the Krakeel wetland should not exceed 2.5% of those total wetland areas.

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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA L01 – GWRU03**



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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA L01 – GWRU03**

Risk Component	Parameter/Measure	Monitoring	
Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Guidelines	Hydrocensus	
	Time series water levels - Monthly	Identify monitoring site - hydrocensus	
Compounds of Concern	Active monitoring site available: None	Regional drawdown < 75th percentile of identified monitoring	
	Peak drawdown in abstraction borehole < critical depth		
	CO ₂ , Time series water quality (Quarterly / Bi annual)	Long term trend < 75th percentile (mg/l) for CO ₂	
	Active monitoring site available: 33 No. sites, 1 No. time series		
	Nutrients	NO ₃ /NO ₂ < 0.5	NO ₃ /NO ₂ < 0.4
	Salts	EC < 21	EC < 21
	Sulphates	SO ₄ < 7	SO ₄ < 6
	Other	Na < 25	Na < 25
		Cl < 48	Cl < 48
		F < 0.2	F < 0.2

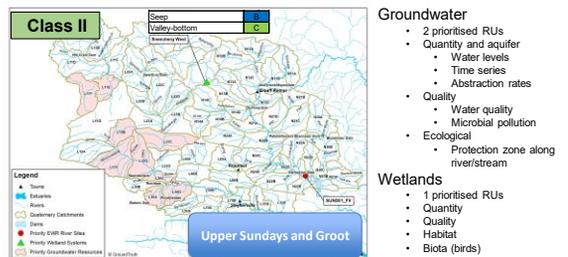
NO ₃ /NO ₂	1
EC	130
SO ₄	250
Na	200
Cl	300
F	1.5

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RESOURCE QUALITY OBJECTIVES: LN CATCHMENT



- Groundwater**
- 2 prioritised RUs
 - Quantity and aquifer
 - Water levels
 - Time series
 - Abstraction rates
 - Quality
 - Water quality
 - Microbial pollution
 - Ecological
 - Protection zone along river/stream
- Wetlands**
- 1 prioritised RUs
 - Quantity
 - Quality
 - Habitat
 - Biota (birds)

IUA No.	IUA Code	Groundwater		Wetlands	
		RU	GW - Priority 1	RU	Quats
5	IUA_LN01	GW_RU13	N13A, N13B and N13C	WRU06	L21D
		GW_RU14	N14A, N14B and N14C		Sneeuberg West

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**RESOURCE QUALITY OBJECTIVES:
WRU06-SNEEUBERG WEST WETLAND**

WRU	Wetland Name	Type	PES	EIS	BAS	Component Prioritised
WRU 06	Sneeuberg Wetland Complex	Valley-Bottom	C	High	C	Habitat – Ecological Condition Habitat – IAPs
		Seep	B	High	B	Habitat – Ecological Condition

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**RESOURCE QUALITY OBJECTIVES:
WRU06-SNEEUBERG WEST WETLAND**

Type	Component prioritised	Indicator	RQO	Mitigation/Monitoring Measures
Valley Bottom	Habitat – Ecological Condition	Desktop and field verified PES category based on a Level 1B WET- assessment undertaken for the Sneeuberg West valley-bottom wetlands.	The PES of the Sneeuberg West valley-bottom wetlands should not fall below the REC, which is a C category.	<p>Every 3-5 years, the WET-Health Level 1B assessment carried out in this baseline assessment needs to be repeated, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. Specific features that need to be assessed include</p> <ul style="list-style-type: none"> No additional dams or plantations should be established in the catchment of the wetland No additional furrows or drains are to be excavated in the wetlands. No further expansion of agricultural activities or other impinging land uses into the remaining natural areas of the wetlands.
	Quantity – flow volumes	The volume of inflows, throughflows, and outflows of the wetland, to ensure some degree of flow maintenance is achieved across the valley-bottom wetlands.	The volume of groundwater inflow into the valley-bottom wetlands should not be reduced further.	Some of the valley-bottom wetlands are associated with dolerite dykes, which are also favoured sites for boreholes in the Karoo generally (Woodford and Chevallier 2002). Thus, some of these valley-bottom wetlands (and possibly some of the seep wetlands as well) may potentially be vulnerable to groundwater abstraction, and further investigation would be very valuable to help establish the surface/groundwater connections and degree to which these dolerite dykes (and sills) might act as hydrological controls (Kotze et al 2022). It may be, for example, that a particular wetland is 'perched' well above the aquifer and, therefore, not affected by aquifer drawdown.

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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA LN01 – GWRU13**

Risk Component	Indicator/Measure	Numerical Limit
Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Guidelines	Regional peak groundwater drawdown < 35.5 m
	Time series water levels - Monthly	Regional long term < 75th percentile of 8.8 m
	Active monitoring site available: 8 No. time series	Peak drawdown in abstraction borehole < critical depth
Compounds of Concern	DOCs, Time series water quality (Quarterly / B annual)	Long term trend < 75th percentile (mg/l) for DOCs;
	Active monitoring site available: 21 No. sites, 4 No. time series	
	Nutrients	NO3/NO2 < 0.12 NO3/NO2 < 0.09
	Salts	EC < 402 EC < 402
	Sulphates	SO4 < 500 SO4 < 501
	Other	H4 < 0.25 H4 < 0.25
		G < 723 G < 723
		F < 0.8 F < 0.8
		Hg < 121 Hg < 121

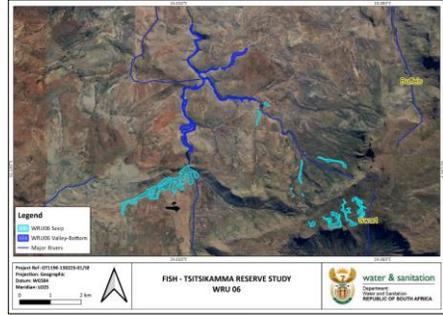
NO3/NO2	1
EC	230
SO4	250
NA	230
G	330
F	1.5

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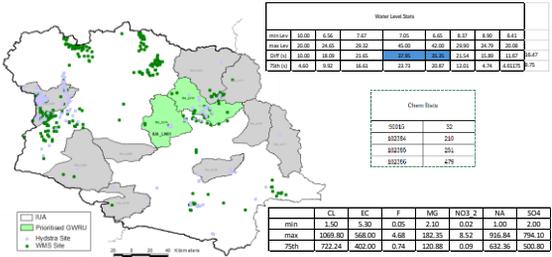
**RESOURCE QUALITY OBJECTIVES:
WRU06-SNEEUBERG WEST WETLAND**



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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA LN01 – GWRU13**



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RESOURCE QUALITY OBJECTIVES: K/L CATCHMENT

Groundwater

- 1 prioritised RUs
- Quantity and aquifer
- Water levels
- Time series
- Abstraction rates

Quality

- Water quality
- Microbial pollution

Ecological

- Protection zone along river/stream

Wetlands

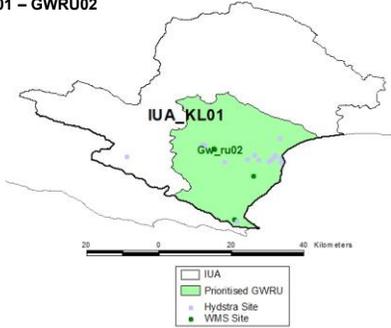
- N/A

IUA No.	IUA Code	Groundwater			Wetlands	
		RU	GW - Priority 1	RU	Quats	Wetlands
2	IUA_KL01	GW_RU02	K90F, K90G and K90E	X	X	X

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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA KL01 – GWRU02**



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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA KL01 – GWRU02**

Water Level Stats												No exclusions			
min Lev	6.74	20.29	6.05	9.05	0.01	2.57	32.67	2.707	4.065	23.22	17.83				
max Lev	36.95	49.35	26.97	40.10	9.05	12.32	72.17	8.37	16.9	33.9	43.19				
Diff (s)	30.21	29.06	20.92	31.05	9.04	9.75	39.50	5.663	12.830	10.68	25.36				20.39
75th (s)	10.09	23.92	3.49	21.65	5.36	6.44	20.92	3.917	7.367	9.4775	21.65				12.21

	Cl	EC	F	NO3 2	NA	SO4	AL	FE	MN
min	68.03	25.50	0.03	0.01	37.69	0.60	0.06	0.01	0.00
max	3325.60	1041.00	1.11	0.41	2083.10	463.50	0.64	0.47	0.23
75th	96.24	35.55	0.18	0.05	50.23	13.82	0.62	0.41	0.06

Chem Stats	
89767	46
89962	2
89967	2
102367	54

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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA KL01 – GWRU02**

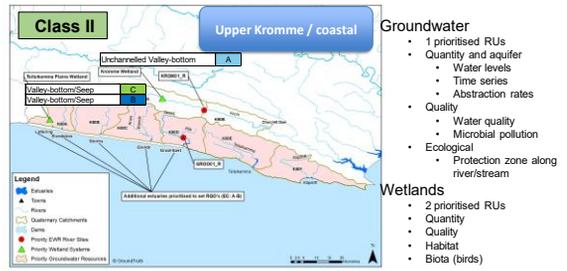
Sub-Component	Indicator/Measure	Numeric Limit	
Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Guidelines	Regional peak groundwater drawdown < 20.4m	
	Time series water levels - Monthly	Regional long term groundwater drawdown < 75th percentile of 12.2m	
	Active monitoring site available - 11 No. time series	Peak drawdown in abstraction borehole < critical depth	
Compounds of Concern	DDCs, Time series water quality (Quarterly / Bi annual)	Long term trend < 75th percentile (mg/l) for DDCs:	
	Nitrates	NO3/NO2 < 0.05	
	Balts	SO4 < 36	
	Sulphates	SO4 < 34	
	Other	Cl < 97	Cl < 96
		F < 0.2	F < 0.2
		Bi < 0.7	Bi < 0.7

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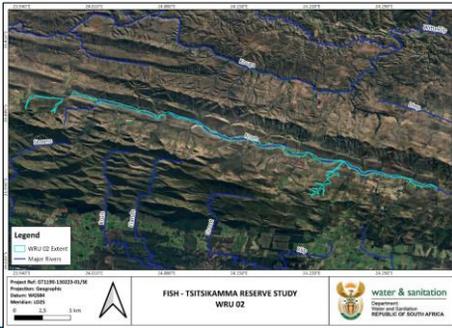
RESOURCE QUALITY OBJECTIVES: K CATCHMENT



IUA No.	IUA Code	Groundwater			Wetlands	
		RU	GW - Priority 1	RU	Quats	Wetlands
1	IUA_K01	GW_RU01	K80A, K80B, K80C, K80D, K80E and K80F	WRU01	K80A	Tatskamma Plains Wetland Complex
				WRU02	K90A	Kromme Wetland

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**RESOURCE QUALITY OBJECTIVES:
WRU02-KROMME WETLAND**



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**RESOURCE QUALITY OBJECTIVES:
WRU02-KROMME WETLAND**

WRU	Wetland Name	Type	PES	EIS	REC	Component Prioritised
WRU02	Kromme Wetland Complex	Unchanneled Valley-Bottom	A	Very High	A	Habitat - Ecological Condition
						Habitat - IAPs
						Habitat - Wetland Vegetation

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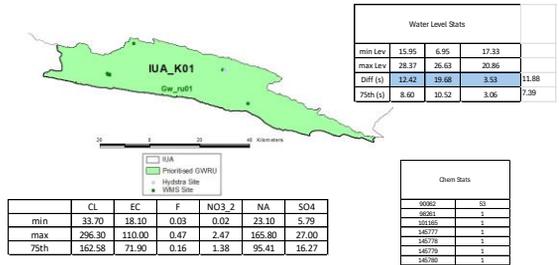
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**RESOURCE QUALITY OBJECTIVES:
WRU02-KROMME WETLAND**

Type	Component prioritised	Indicator	ROO	Mitigation/Monitoring Measures
Unchannelled Valley Bottom	Habitat – Ecological Condition	Desktop and field verified PES category based on a Level 1B WET-Health assessment undertaken for the Kromme wetland complex.	The PES of the Kromme wetland complex should not fall below the REC of A.	Every 3-5 years, repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change in the wetland and its catchment, as well as at least 8 hours of field verification for each wetland. Specific factors that need to be assessed include: <ul style="list-style-type: none"> No further expansion of agricultural activities or other impinging land uses into the remaining natural areas of the wetlands. No additional surface water-reducing activities in the wetlands or their catchments No further deterioration in the water quality component of the PES score of the wetlands.
	Habitat – IAPs	Extent of IAPs within the wetland relative to the extent recorded in the baseline assessment.	IAPs extent should be managed to ensure it does not increase above the extent mapped in the baseline assessment (2.5%) for the Krugerstand and Kuqungqasidwini wetlands.	Using available remote imagery, the extent of IAPs and removal efforts must be assessed annually. Site visits to confirm the extent and removal of IAPs should be carried out every two years. The extent of IAPs within the Kromme wetland should not exceed 2.5% of the total wetland area.
	Habitat – Wetland Vegetation	Extent and overall health of the Wetland Phragmites (Palmet) population within the wetland.	Maintain a viable Phragmites population within the Kromme and Kuqungqasidwini wetlands.	A fire record for the wetland must be established to ensure that infrequent fires are maintained within the wetland (every 8-12 years). Agreements with landowners need to be set up to ensure that burning can or does take place at the requisite times. Infield verification must occur to verify that IAPs are cleared before each fire and the extent of each fire. Controlled burns should only be carried out in the dry season.

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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA K01 – GWRU01**



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**RESOURCE QUALITY OBJECTIVES : GROUNDWATER
IUA K01 - GWRU01**

Sub Component	Indicator/Measure	Notes/Limit
Water Levels	Groundwater levels at active monitoring boreholes using Groundwater Monitoring Quadrates	Regional peak groundwater drawdown < 11.9m
	Time series water levels - Monthly	Regional long term < 75th percentile of 7.4m groundwater drawdown
	Active monitoring site available: 3 No. time series	
Compounds of Concern	Peak drawdown in abstraction borehole < critical depth	
	CCOC: Time series water quality (Quarterly / 8 annual)	Long term trend < 75th percentile (mg/l) for CCOC:
Nutrients	NO3/NO2 < 1.4	NO3/NO2 < 1.4
	EC < 72	EC < 75
Salts	SO4 < 17	SO4 < 17
	Na < 96	Na < 105
Other	Cl < 97	Cl < 105
	F < 0.2	F < 0.2
	Mn < 0.3	Mn < 0.3

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THANK YOU!

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All study reports can be accessed from the DWS website: <https://www.dws.gov.za/RDM/WRCS/>

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